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(71) Applicant: **KIMBERLY-CLARK CORPORATION**  
401 North Lake Street  
Neenah Wisconsin 54956(US)

(72) Inventor: Heran, William M.  
108 Ljmeklin Drive  
Neenah Wisconsin(US)

(72) Inventor: **Fleischer, Glen R.**  
533 Kessler Drive  
Neenah Wisconsin(US)

(72) Inventor: **Damico, Joyce Ann**  
1219 Green Acres Lane  
Neenah Wisconsin(US)

(72) Inventor: **Van Gompel, Paul Theodore**  
route 2, Box 227  
Hortonville Wisconsin(US)

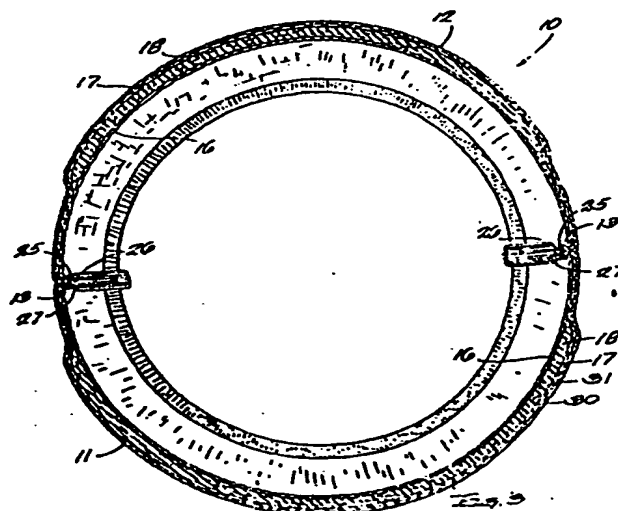
(72) Inventor: **Van Deurzen, John Irvin**  
224 Fredrick Street  
Menasha Wisconsin(US)

(72) Inventor: **Strohbeen, David Thomas**  
106 Cherry Court  
Appleton Wisconsin(US)

(74) Representative: **Sauvage, Renée**  
Cabinet Sauvage 100 bis, avenue de Saint-Mandé  
F-75012 Paris(FR)

(54) Disposable underpants, such as child's training pants and the like.

(57) A disposable underpant comprising a front panel (11) and rear panel (12) joined together along side seams (13) to provide a three-dimensional garment having a pair of elasticized leg openings and an elasticized waist opening, and including a bodyside liner (15), outer covering (17) and absorbent batt (18) therebetween, in which the outer covering (17) has an inner layer (30) of plastic material and an outer layer (31) of nonwoven fibrous material.



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DISPOSABLE UNDERPANTS, SUCH AS  
CHILD'S TRAINING PANTS AND THE LIKE

Technical Field

5        This invention relates generally to the field of disposable underpants having elasticized leg and waist openings, particularly disposable child's training pants and similar garments.

Background Art

10       Disposable diapers, as is well known, now find wide-spread use for infant care and have generally replaced the use of cloth diapers. The typical disposable diaper is a three-layer composite structure comprising a liquid  
15       permeable bodyside inner liner, a liquid impermeable outer cover and an absorbent batt sandwiched between the liner and the cover. Materials now in general use for the three principal elements of a disposable diaper include various types of nonwoven fabrics for the bodyside liner, a thin  
20       thermoplastic film for the outer cover and cellulosic fluff for the absorbent batt.

      Disposable diapers of the type presently on the market are flat open-sided garments that are intended to be fit about an infant by a parent while the infant is lying down.  
25       The rear panel of the diaper is placed underneath the infant, and the front panel drawn between the infant's legs, after which the sides are overlapped and held together by pressure sensitive adhesive tape. A diaper is meant for use when the child is young and dependent upon a parent for this  
30       essential purpose.

      The popularity of disposable diapers indicates a demand for a disposable underpant, such as a disposable training pant that can be used when a child grows out of a diaper. Diapers are typically used with infants up to about fifteen  
35       months old. When a child reaches an age in the range of about fifteen to thirty months, however, a parent generally

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desires to start toilet training so that the child can become independent of a parent. The training pant is intended for use when the child has reached an age at which he or she is ready to graduate to an underpant type of garment as a replacement for disposable diapers previously used. Thus, a suitable training pant must be a garment having closed sides so that a child can raise and lower it as necessary without requiring the aid of a parent. At the same time, a training pant must provide features of liquid and solid absorbency and prevent leakage of the waste fluids.

Cloth training pants, although widely used, have disadvantages. Current cloth training pants have very little absorbency and often must be used with exterior rubber or plastic pants. When a child wets a cloth training pant, most often all of the child's clothes must be changed. Further, if a child has a bowel movement, it is difficult to remove a cloth pant without making a mess, and the pant must be soaked and bleached. All of these factors can make the toilet training process frustrating for both child and parent.

In addition, it is believed that the psychology of the toilet training stage is such that the child should perceive he or she is graduating to a garment that is different than a disposable diaper. The requirements for a disposable underpant such as a training pant are not satisfactorily met by the constructions of disposable diapers as currently known in the art. In this connection, for example, the typical disposable diaper, as stated previously, has an outer layer comprising a liquid impermeable sheet of plastic film. Various techniques have been used to give the plastic sheet the feel and appearance of texture, but the exterior of the garment has a plastic feel or appearance which is

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5 closely associated with the concept of a diaper but would be inappropriate for a disposable training pant. Since the purpose of a training pant is to encourage the child to make the transition from diapers to washable or reusable cloth underpants, it is important that a disposable training pant simulate a cloth underpant as much as possible.

10 The need for a disposable training pant or similar underpant capable of meeting the demand for this type of garment has been the impetus for the development of the present invention.

15 Summary of the Invention

An object of this invention is to overcome disadvantages of prior disposable underpants.

A further object of this invention is to create a discrete side seal for disposable garments.

20 A further object of this invention is to simplify the manufacture of disposable undergarments.

A further additional object of the invention is to provide strong garment side seals.

25 Our present invention provides a disposable underpant, particularly a disposable training pant, comprising a three-dimensional garment having closed side seams, an elasticized waist opening and elasticized leg openings, and including a bodyside liner and outer cover with an absorbent batt sandwiched therebetween, wherein the outer cover is a  
30 two layer composite material providing the dual characteristics of liquid imperviousness and a clothlike appearance.

35 The formation process for the pant involves the necessity of formation of the garment with the interior facing outward for side sealing after which the garment is reversed prior to packaging for sale. Reversing of the

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5.. completed elasticized garment is an extra mechanical  
handling step that it would be desirable to eliminate as it  
is complicated and expensive. However, generally  
undergarments have been formed with inner side seams seals  
as the looks is improved by not having flaps on the outer  
surface. Further, the turning of the flaps to the inside of  
10 the garment has created additional difficulties in that the  
inside seals can be a source of skin irritation unless they  
are carefully formed. On the other hand, if exterior  
conventional seals are formed, they create flaps that have  
an undesirable appearance as it is intended that the  
15 garments resemble cloth underpants which do not have  
exterior seams. Therefore, there is a need for an exterior  
seal on a disposable garment that is discrete, strong, and  
easy to form.

20 In one embodiment, the side seam of the invention is  
particularly advantageous for disposable garments where low  
cost formation is especially desirable. The side seal of the  
invention is strong and further the seal is particularly  
effective for multi-layered garments, even providing seam  
adhesion when elastic is within the seam. Further, the  
25 multi-line bond provides a higher bond strength than one  
large seal at the edges. The multi-line sealing provides an  
attractive almost invisible edge. The formation of the  
outer seal does not provide a seam on the inside of the  
garment to irritate the wearer. These and other advantages  
30 will be apparent from the detailed description below.

This structure provides a disposable undergarment which  
is perceived as protective underwear for a child rather than  
a diaper associated for use by an infant. An undergarment  
to be suitable for use in toilet training children or by  
35 incontinent children or adults should comprise a) a nonwoven  
fabric cover having a front portion, a rear portion and a

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5 crotch portion connecting the front and rear portions, both  
side margins of the front portion being joined to respective  
side margins of the rear portion so as to define a  
three-dimensional undergarment having a pair of leg openings  
and a waist opening; b) a liquid pervious inner liner and an  
absorbent batt between the liner and the fabric cover, a  
10 first elastic means extending about one leg opening, a  
second elastic means extending about the other leg opening,  
and a third elastic means extending about the waist opening.

#### Description of the Drawings

15 Fig. 1 is a perspective view of a disposable underpant  
according to the present invention;

Fig. 2 is a side perspective view of the disposable  
underpant of Fig. 1;

20 Fig. 3 is a horizontal sectional view of the disposable  
underpant of Fig. 1;

Fig. 4 is a partial horizontal sectional view similar  
to Fig. 3 illustrating an alternate form of side seam for  
the disposable underpant of Fig. 1;

25 Fig. 5 is a plan view, with portions broken away  
illustrating a flat blank as suitable for producing the  
underpant of Fig. 1;

Fig. 6 is a plan view, with portions broken away,  
illustrating another form of flat blank suitable for  
producing the underpant of Fig. 1;

30 Fig. 7 is a sectional view of a side seam in accordance  
with the invention.

Fig. 8 is a side perspective view of an alternate form  
of the disposable panty of Figure 1.

35 Fig. 9 is a sectional view of a side seam at the waist  
of a disposable underpant in accordance with the invention.



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Fig. 10 is a partial sectional view illustrating one form of elasticized leg and/or waist opening of the underpant of Fig. 1;

Fig. 11 is a partial sectional view illustrating another form of elasticized leg and/or waist opening for the underpant of Fig. 1; and

Fig. 12 is a side perspective view of an alternate form of the disposable panty of Fig. 1.

#### Detailed Description of the Invention

Figs. 1 and 2 illustrate, in front and side perspective views respectively, a disposable underpant 10 constructed in accordance with the present invention. The underpant 10 includes a front panel 11 and a rear panel 12 joined together alongside seams 13 to form a three-dimensional garment with closed sides having a pair of leg openings 14 and a waist opening 15. Referring now to Fig. 3, the underpant 10 includes a moisture pervious bodyside liner 16, a moisture impervious outer cover 17, and an absorbent batt 18 positioned between the liner 16 and outer cover 17. The absorbent batt may be secured to either the bodyside liner or the outer cover, or both, by any suitable means well known in the art such as lines or other patterns of adhesive, pressure sensitive tapes, heat seals, sonic seals, etc.

Referring again to Fig. 1, the waist opening 15 of the underpant 10 is surrounded by a circumferential elasticized band 20 and each leg opening 14 is surrounded by a circumferential elasticized band 21. Suitable constructions for the elasticized bands 20 and 21 are described in further detail later in this description.

The bodyside liner 16 can be any flexible porous sheet which passes fluids therethrough, i.e. a moisture pervious

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5 material, to be absorbed by the absorbent batt 18. The  
liner may comprise a nonwoven web or sheet of polyolefin  
fibers, such as polypropylene or polyethylene, or polyester  
fibers; a web of spun bonded polypropylene, polyethylene or  
polyester fibers; a web of rayon fibers; a bonded carded web  
10 of synthetic or natural fibers, or a mixture of synthetic  
and natural fibers, and the like. Further the liner 16 may  
also comprise a plastic film which is perforated or  
apertured to obtain the desired degree of moisture  
perviousness, and may also comprise an expanded plastic  
webbing material or a scrim material. The bodyside liner 16  
15 preferably is made of a material which will feel soft and  
comfortable against the skin of an infant or adult.

The absorbent batt 18 may comprise any suitable  
material capable of absorbing and retaining waste fluids  
that pass through the liner 16. Thus, the absorbent batt  
20 may comprise cellulosic material such as an air-formed batt  
of wood pulp fibers, commonly known as "fluff"; a batt of  
melt blown synthetic fibers, such as macrofibers or  
microfibers, of polypropylene, polyethylene, polyester and  
the like; a bonded carded web of synthetic or cellulosic  
25 fibrous materials; a composite of melt blown fibers, such as  
macrofibers or microfibers of polypropylene, polyethylene  
polyester or the like mixed with pulp fibers; or a blend of  
fluff with staple textile fibers such as rayon and the like.  
Preferably the batt should contain a high hardwood pulp  
30 content since this increases the fine microfiber pore  
structure in meltblown and similar batts and therefore  
improves absorbency and liquid retention. The batt may  
comprise one or more layers or combinations of the foregoing  
materials.

35 Preferably, the batt may include compounds added to  
increase its absorbency. The material selected for the

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absorbent batt most usefully has an absorbent capacity in  
the range of about 30 to 550 grams of synthetic urine  
retained at 0.5 psi. For a disposable training pant  
intended for infant use after the diaper stage, the  
absorbent capacity of the batt is preferably in the range of  
about 350 to 500 grams of synthetic urine retained at 0.5  
psi. Furthermore, it is desirable that the underpant not  
present a diaper appearance and the absorbent batt therefore  
most usefully comprises a low bulk, high absorbency  
material. Preferably the batt will contain a  
three-dimensional dispersion of particles of water insoluble  
hydrocolloid polymer. The superabsorbent is preferably  
dispersed uniformly in a three-dimensional configuration  
within the voids of the fibrous batt but in the region which  
is closest to the outer fabric cover, so that liquids  
contacting the batt penetrate freely within the batt to  
superabsorbent particles farthest from the skin of the  
wearer. There are several types of superabsorbent materials  
that are commercially available:

- a. Grafted starch
- b. Starch polyacrylic acid grafted copolymer
- c. Grafted cellulose - (CMC) carboxy - methyl  
cellulose
- d. Modified PVA (polyvinyl Alcohols), and preferably
- e. Polyacrylic acid salts that are crosslinked to  
form absorbent polymers such as Water-Loch J-500 (Acquaqueep  
OSH) produced by Seitetsu in Japan.

Preferably the tensile strength of the absorbent batt  
should be from about 1.75 psi to about 5.00 psi. Also  
preferably, the burst strength of the absorbent batt should  
range from about 250 ergs/cm<sup>2</sup> to about 550 ergs/cm<sup>2</sup> dry and  
from about 300 ergs/cm<sup>2</sup> to about 500 ergs/cm<sup>2</sup> wet.

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5 Preferably the absorbent batt is formed having an outwardly bulging crotch portion. By contouring the batt in a manner providing the bulge in the crotch, the undergarment has a significantly greater amount of absorbent material in the crotch portion for improved protection from leakage in an area where it is most needed. In addition, 10 advantageously decreasing the amount and thickness of the absorbent material upon approaching the periphery of the absorbent batt and the undergarment, i.e. in the longitudinal or end edges 54 and 53, provides increased discreteness for the wearer. The undergarment will not have a tendency to stick out during use. Additionally, it is 15 preferable that the absorbent batt be shaped such that when applied to the outer cover the absorbent batt should be absent in the ear portion, i.e., the portions of the outer cover lying outside the longitudinal line extending from the innermost portion of the curved leg opening, since the 20 undergarment does not require absorbency in this region and absence of the absorbent material provides for a more discreet fit on the wearer and does not stick out during use.

25 Preferably, the undergarment is formed such that the traverse measurement of the crotch section of the absorbent batt is less than about 3 inches. More preferably the traverse measurement of the overall diaper is less than about 4 inches. The thickness in the bulge portion of the 30 absorbent batt in the crotch portion is preferably about 1.5 to 5 times the thickness of the absorbent material located in the front and rear portions of the absorbent batt. Preferably the thickness of the absorbent batt in the crotch portion is about 2 times the thickness of the absorbent 35 material in the front and rear portions. Preferably during the formation of the absorbent batt a web of absorbent is

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5 cut transversely with a generally elliptically shaped cutout  
being made in the leg area. This leg area ellipse is folded  
over onto the top of the crotch portion. The ellipse is  
shown in Fig. 5 as 154; the ellipse is then placed atop the  
absorbent batt in Fig. 6 in crotch region 156. Preferably  
the traverse width of the absorbent material in the crotch  
10 portion is  $1/4$  of the sum of the widest traverse  
measurements of the front and rear portions. Forming an  
absorbent batt in this configuration eliminates the need for  
a waste of the absorbent material while unexpectedly forming  
an absorbent batt that provides additional absorbency in the  
15 needed areas and proper sizing about the waist.

Preferably the leg area ellipse is sized such that it  
covers at least 30 percent, more preferably 50 percent of  
the absorbent batt and is biased in size toward the front of  
the training pant.

20 In accordance with a highly preferred aspect of  
this invention, the outer cover 17 performs the dual  
functionality of providing moisture imperviousness and also  
providing a textile feel and look for the underpant 10. For  
this purpose, referring now to Fig. 3, the outer cover 17  
25 comprises a two-layer composite material having an inner  
layer 30 and an outer layer 31. The inner layer 30 is a  
layer or stratum of plastic material which provides a  
moisture barrier or liquid imperviousness.

Suitable polymer materials for the inner layer 30 are  
30 polyolefin polymers such as polyethylene or polypropylene;  
polyolefin copolymers such as ethylene vinyl acetate,  
ethylene methyl acrylate or ethylene ethyl acrylate;  
polyvinyl chloride; nylon; or other thermoplastic materials  
capable of providing liquid imperviousness. The inner layer  
35 30 of the outer cover should provide a sufficient degree of  
liquid imperviousness to prevent or preclude waste fluids

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5 from striking through or penetrating through the outer  
cover. The outer layer 32 of the cover 17 most preferably  
consists of a layer of nonwoven fibrous material. Materials  
suitable for the outer layer 31 include a spun-bonded  
nonwoven web of synthetic fibers such as polypropylene,  
polyethylene or polyester fibers; a nonwoven web of  
10 cellulosic fibers, textile fibers such as rayon fibers,  
cotton and the like, or a blend of cellulosic and textile  
fibers; a spun-bonded nonwoven web of synthetic fibers such  
as polypropylene, polyethylene or polyester fibers mixed  
with cellulosic, pulp fibers or textile fibers; or melt  
15 blown thermoplastic fibers, such as macrofibers or  
microfibers, of polypropylene, polyethylene, polyester or  
other thermoplastic materials or mixtures of such  
thermoplastic macrofibers or microfibers with cellulosic,  
pulp or textile fibers.

20 The inner layer 30 and outer layer 31 of the cover 17  
are advantageously bonded to one another, by any means  
appropriate for the specific materials selected for the two  
layers. The two layers can be laminated using heat or  
pressure or both heat and pressure. The two layers can also  
25 be bonded with adhesive, heat sealing or ultrasonic sealing.  
In addition, thermoplastic polymeric material of the inner  
layer 30 can be extrusion coated onto the nonwoven outer  
layer 31. If desired, the textile effect of the nonwoven  
outer layer 31 can be further enhanced by various embossing  
30 patterns.

35 Fig. 3 illustrates one form of side seams 13 for the  
underpant 10 that is made by seaming together exterior  
contacting side edge portions of the outer layer 31 of the  
outer cover 17 of the front and rear panels. This provides  
a narrow fin seam, which can be made relatively narrow such  
as about 3/16 to 1/2 inch wide so as to minimize the amount

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of seam which is visible. The seams 13 between the  
outwardly contacting side edge portions of the outer cover  
can be formed by any suitable means well known in the art  
appropriate to the specified material employed for the outer  
layer 31 of the cover; thus, sonic sealing, heat sealing,  
adhesive bonding, and the like are appropriate techniques.  
Fig. 4 illustrates an alternate construction for the side  
seams 13 wherein side edge portions of the garment are  
overlapped and joined together with an adhesive element 35  
coated on both of its opposed surfaces with layers 36 and 37  
of pressure sensitive adhesive. In this alternate  
embodiment, a side edge portion of the bodyside inner liner  
16 of the rear panel 12 is bonded to a side edge portion of  
the outer layer 31 of the outer cover of the front panel 11  
of the underpant 10. Sonic sealing and heat sealing  
techniques also can be used to bond the overlapped portions  
as shown in Fig. 4. Other side seam constructions effective  
to form a garment having closed sides can be employed to  
form the underpant 10, and sewn side seams may be of  
interest such as for some types of adult underpants.  
Another embodiment includes an exterior seam, not shown.

An especially useful construction for the side seams 13  
is a manually tearable or tearaway seam. This can be  
obtained by bonding the contacting side edge portions along  
a narrow bond within the side seam portions. A bond  
strength of about 2000 grams/inch of seam length (as  
measured on an appropriate instrument such as an Instron  
tensile tester) is suitable for providing a tearaway seam  
but which is also strong enough to hold the garment  
together. One way to make a seam of this type is to bond  
the contacting side portions by suitably controlled sonic  
sealing along a narrow bond portion that is about 1/8" wide.  
A tearaway seam is a highly advantageous and preferred

5 feature because a parent can manually tear the side seams  
apart in order to remove the underpant from a child; this is  
particularly helpful when the underpant is quite soiled and  
removal in the normal fashion would be messy. A manually  
tearaway seam can be with both the inturned fin style seams  
illustrated in Fig. 3 or the overlapped seam of Fig. 4.

10 Another important consideration in forming a strong bond  
which provides for a tearaway feature includes selection of  
a suitable material for the cover. Propylene, ethylene  
vinyl acrylate, ethylene ethyl acrylate and ethylene methyl  
acrylate are preferred. Polyethylene is not preferred but  
15 ethylene methyl acrylate copolymers of ethylene may be used.

The side seams 13 in Fig. 3 are shown as incorporating  
another useful structural feature. The inturned contacting  
side edge portions of the garment are joined together along  
a narrow bond portion 25 that is spaced from the free ends  
20 26 of the side edge portions. This provides a side seam  
having a flap portion 27 inside the garment along which the  
side edge portions are not bonded together so as to be free  
of one another. Any bond portion, such as formed by sonic  
sealing, heat sealing or adhesive bonding, will be  
25 relatively stiff. The flap portion 27 acts as a cushion  
between a person's body and the stiff bond portion 25,  
thereby enhancing the comfort or wearability of the  
underpant 10. It has been found that a bond portion about  
1/16" to 1/8" wide and a flap portion about 1/8" to 3/8"  
30 wide are suitable for this purpose and provide a fin seam  
that will not irritate an infant or adult wearing the  
underpant 10.

The underpant 10 can be expeditiously manufactured from  
a blank cut to a suitable configuration. An appropriate  
35 blank 50 is illustrated in Fig. 5. A sheet of material for  
the outer cover 17 is cut to an hourglass configuration



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having arcuate cutouts defining the leg openings of the garment. Absorbent batt 18, also cut to an hourglass configuration with arcuate leg cutouts, is placed on top of the outer cover in the desired position, and may be secured thereto by spaced parallel glue lines 51. Preferably the batt is shaped such that the extensions of the batt in the areas outside longitudinal lines 258 and 260 in Fig. 6 extending from the traverse edge of the inside crotch portion is limited. An arcuate elastic means 52 is positioned around each leg cutout and preferably, as explained below, positioned along the outer edge of the cover 17 along the cutout portion. Linear elastic means 53 are positioned along each end 54 of the blank, which will form the elastic means for the waist portion of the finished garment. As indicated in Fig. 5, the elastic means 52 are positioned closely adjacent the nearby edge of the absorbent batt so as to provide a form fitting panty type of garment instead of being spaced from the batt to have a web of material between the elastic means and the batt as is common with some disposable diapers. Next, a sheet of bodyside inner liner 16, also cut to an hourglass configuration, is placed over the assembly of the outer cover and the batt. Both the liner 16 and cover 17 have superimposed marginal portions which project beyond the margin of the batt 18, and the liner and cover may be joined together with elastics 52 and 53 within the superimposed marginal portions. After being fully assembled, the blank 50 is folded along its central transverse area and the sides of the front and rear panels are seamed together as illustrated in Fig. 3 to form the finished underpant 10.

Fig. 6 illustrates a blank 60 suitable for producing underpant 10 having side seams of the type illustrated in Fig. 4. Most elements of the blank 60 are the same as those

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5 of the blank 50 and the corresponding elements are therefore  
numbered with the same reference numerals. Blank 60  
includes an adhesive element 35 of two-side coated pressure  
sensitive adhesive tape along each side edge portion 61 of  
the rear panel 12. Thus (see especially Fig. 4) adhesive  
layer 36 of each element 35 is adhered to a side marginal  
10 portion of the outer cover of the rear panel 12. To produce  
the underpant 10 from the blank 60, the blank is folded  
along its transverse medial portion and the side edge  
portions 61 of the front panel are joined together to the  
layer 37 of pressure sensitive adhesive of each element 35  
15 in the manner shown in Fig. 4. The blank 60 also shows an  
alternate form of securing the absorbent batt 18 by use of  
two side pressure sensitive adhesive elements 62 between the  
batt and outer cover 17.

20 Fig. 7 is an enlarged view of the cross-sectional view  
of seam 13 in Fig. 3. The seam is composed of a six-layered  
structure of the outer fabric layer 31, the inner  
impermeable layer 30 of the cover sheet, as well as the  
permeable layer 16 forming the liner of the garment.  
Therefore, the seal 13 has six layers, all of which must be  
25 sealed together to form a small unobtrusive bond. This is  
done by sealing with a series of lines 80 that form the  
pressured areas 80 and raised lined areas 82. The sealing  
is accomplished within a preferred width of about 1/8" with  
a plurality of sealing lines being formed within this space.  
30 As illustrated, there are three sealing lines 80, 84, and 86  
within the seal 13. Surprisingly, it has been found that  
the multi-line sealing carried out with ultrasonic sealing  
is stronger when a series of narrow lines are formed rather  
than a larger continuous sealed area.

35 The series of seal lines may be formed by any desired  
method. Typical of such methods are adhesive and heat

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5 sealing. A particularly preferred system for the invention  
is found to be ultrasonic sealing. It has been found that  
an ultrasonic sealing anvil having a plurality of lines  
closely spaced together such that four sealing lines may be  
fit within the preferred space of between 1/8" and 3/16" is  
particularly desirable. The sealing lines may be  
10 discontinuous, forming dashed lines.

In formation of the lines an ultrasonic apparatus  
suitable is a Branson 851 Model ultrasonic Sealing Unit and  
with a preferred anvil of 1/8" width and 6.0" length having  
engraved thereon a line pattern of about 0.45 mm wide lands  
15 and valleys about 0.35 mm wide forming four lines in a total  
width of about 1/8". This anvil is suitably applied with  
350-1700 psi force for .05-2.0 seconds to the composite  
forming the side seal of the garment to laminate the front  
and back portions together. The preferred anvil force is  
20 about 400-600 psi force for about 0.3 seconds.

Illustrated in Fig. 8 is a cross section of the garment  
10 taken on section line 6 of Fig. 1 such that the  
cross-section of the seam 13 is taken at the waist elastic.  
Surprisingly it has been found that the ultrasonic sealing  
forming a pattern of sealed valleys 92 and raised lines 94  
25 between the valleys even seals in this area where the front  
and back waist elastic 96 and 98 are present in the seam.

Fig. 9 illustrates an alternate system for construction  
of the underpant of the present invention wherein the  
underpant 10' includes a separate front panel 11 and rear  
30 panel 12 that are joined together along central crotch seam  
65. The remaining elements of the underpant 10' are the  
same as in underpant 10 and the common elements are  
identified with the corresponding reference numerals  
employed in Fig. 1. Fig. 9 represents an alternative method  
35 for constructing the underpants of the present

invention as compared to making the underpants with the folded blanks 50 of Fig. 5.

The discrete, strong, nonleaking side seal of the invention may be formed in any desired width. Generally the seam would have a width of between about 1/16" and about 3/16". It is preferred that the seam have a total width of about 1/8". Within the seam area encompassed by the lines of sealing in the seam's bonding area the sealed valley portions are generally about 25% to about 100% of the total. The number of lines may be any desired number greater than 1. Generally it has been found that four sealing lines in a space of about 1/8" with about 50% seal area are suitable.

Any suitable elastomeric material can be employed for the elastic in the garments of the invention that exhibits at least an elongation (defined herein as  $L_s - L_r / L_r$  where  $L_s$  is the stretched length of an elastic element and  $L_r$  is retracted length, multiplied by 100 to obtain percent elongation) in the range of 5% to 300% preferably in the range of 25% to 200%. Further along these lines, there may be some preferential vagaries in respect of the elasticity of these elastic means relative to the geometry elected by the designed. For example, within the preferred range mentioned above, it has been determined that a most preferred range for the leg elastic is from about 80 to about 110 for rope elastic and about 40 to about 70 for ribbon elastic. Also for the waist elastic the preferred range is from about 200 to about 250 for rope elastic and about 60 to about 200 for ribbon elastic. Preferably the elastic has a spring constant of from about 5 to about 40 gms/cm and more preferably from about 15 to about 22 gms/cm.

Various commercially available materials can be used, such as natural rubber, butyl rubber or other synthetic rubber, urethane elastomeric material such as that available

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5 from B. F. Goodrich Company under the trademark TUFTANE, and  
elastomeric material available from the H. B. Fuller Company  
under the tradename FULLASTIC. The latter material (see  
e.g. U.S. Patent 4,418,123) is based upon thermoplastic  
elastomeric copolymers of the A-B-A type such as those  
10 available from Shell Chemical under the trademark KRATON  
which have a rubbery midblock such as butadiene or isoprene  
and polystyrene end blocks, and is especially useful because  
it is a self-adhesive material and can be applied to the  
layers of the garment without additional adhesive between  
the elastic means and the layers. The elastic means can be  
15 applied to the garment by any suitable means including  
adhesive bonding, heat sealing or sonic bonding, whichever  
is appropriate to the specific material selected for the  
elastic means.

Fig. 12 illustrates an alternate system for  
20 construction of the underpant of the present invention  
wherein the underpant 10' includes a separate front panel 11  
and rear panel 12 that are joined together along central  
crotch seam 65. The remaining elements of the underpant 10'  
are the same as in underpant 10 and the common elements are  
25 identified with the corresponding reference numerals  
employed in Fig. 1. Fig. 12 represents an alternative  
method for constructing the underpants of the present  
invention as compared to making the underpants with the  
folded blanks 50 and 60 of Figs. 5 and 6.

30 Figs. 10 and 11 illustrate particularly useful forms of  
elastic means for use at the leg openings and waist opening  
of the underpant 10. The elastic means constructions of  
Figs. 10 and 11 are as described and claimed in the commonly  
assigned co-pending patent application of Ales et al.  
35 entitled "Elastic Form-Fitting Closure Constructions for  
Disposable Garments," filed on January 10, 1985, U.S. Serial

No. 690,348, the disclosure which is incorporated herein by reference. As shown in Fig. 10, elastic means 54 comprises a strip of elastic material 70 having opposed surfaces 71 and 72, wherein surface 71 is bonded to closely spaced bond points along an edge portion of the inner layer 30 of the outer cover 17 and surface 72 is bonded to an edge portion of the interior surface of the bodyside liner 16. Further, the outer edges of the liner 16, cover 17, and elastic strip 70 are contiguous with one another. The elastic strip 70 is bonded to the liner 16 and cover 17 along the entire area of its surfaces 71 and 72 when applied thereto in an elongated or stretched condition; upon retraction of the elastic strip 70, micro-buckling of the outer cover between bond points results in an elasticized waist or leg opening which has a smooth yet finely ribbed or pleated appearance. Fig. 10 is a sectional view of the elasticized band 21 around the leg openings of the garment 10, and the elasticized band 20 around the waist opening can be of the same structure.

The construction illustrated in Fig. 11 is similar to that of Fig. 10 except that the elastic means 53 comprises a plurality of spaced parallel strands 75, 76 and 77 of elastic material, each strand having a circular cross section, as described and claimed in the commonly assigned co-pending application of Ales et al. entitled "Disposable Garment with Multiple Strand Elasticized Openings," U.S. Serial No. 690,349, the disclosure of which is incorporated herein by reference. The elastic means construction of Fig. 8 can be used either for the circumferential elasticized band 20 around the waist opening of the underpant or the elasticized bands 21 around the leg openings 14 of the underpant, or both; a presently preferred embodiment of the underpant 10 is to employ the elastic means construction of Fig. 10 for the circumferential band 20 about the waist

opening and the elastic means construction of Fig. 11 for  
5 the elasticized band 21 of the leg openings with a good seal  
against leakage of fluids therethrough. The underpant 10,  
however, can be constructed with other types of elasticized  
bands at the waist opening and the leg openings, such as,  
for example, a strip of elastic material intermittently  
10 bonded or sewn to either the outer cover 17 or inner liner  
16, or both, along the waist opening and leg openings.  
Preferably the elastic means about the waist and/or the legs  
is at least two ribbons or ropes. Also, the elastic means  
can be contiguous with the outer edges of the liner and  
15 cover along the elasticized openings as shown in Figs. 10  
and 11, or it can be spaced inwardly thereof; in the latter  
instance, it is preferred that the elastic means be spaced  
only slightly inwardly of the edges of the garment if it is  
desired to avoid a gathered look about the leg and waist  
20 openings.

The tension measurement found useful was determined by  
stretching the leg opening to 10.5 inches for the small  
training pant (20 - 29 pounds) and 11.5 inches for the  
medium training pant (30 - 39 pounds), holding for five  
25 minutes and then measuring the tension in grams. A similar  
procedure was followed for the waist except the opening was  
stretched to 18.5 inches for the small and 19.5 inches for  
the large. These stretching distances were determined as  
being the average leg and waist size for the wearer of the  
small training pant and the medium training pant.  
30

Preferably the tension exerted by the elastic means in the  
leg area ranges from about 165 to about 220 grams, more  
preferably from about 180 to about 200 grams. The elastic  
means about the leg opening preferably comprises at least  
35 two elastic members where the tension on the member closer  
to the absorbent batt is greater than the tension on the

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5 elastic member further from the absorbent batt. More preferably the ratio of the tension on the members is from about 4:3 to about 3:2. In the waist region the preferred tension is from about 330 to about 400 grams and more preferably from about 360 to about 380 grams.

10 Any suitable elastomeric material can be employed for the elastic means 52 and 53 that exhibits at least an elongation (defined herein as  $L_s - L_r / L_r$  where  $L_s$  is the stretched length of an elastic element and  $L_r$  is retracted length, multiplied by 100 to obtain percent elongation) in the range of 5% to 300% preferably in the range of 25% to 15 200%. Further along these lines, there may be some preferential vagaries in respect of the elasticity of these elastic means relative to the geometry elected by the designer. For example, within the preferred range mentioned above, it has been determined that a most preferred range 20 for the leg elastic is from about 80 to about 110 for rope elastic and about 40 to about 70 for ribbon elastic. Also for the waist elastic the preferred range is from about 200 to about 250 for rope elastic and about 60 to about 200 for ribbon elastic. Preferably the elastic has a spring 25 constant of from about 5 to about 40 gms/cm and more preferably from about 15 to about 22 gms/cm.

30 Various commercially available materials can be used, such as natural rubber, butyl rubber or other synthetic rubber, urethane elastomeric material such as that available from B. F. Goodrich Company under the trademark TUFTANE, and elastomeric material available from the H.B. Fuller Company under the tradename FULLASTIC. The latter material (see e.g. U.S. Patent 4,418,123) is based upon thermoplastic elastomeric copolymers of the A-B-A type such as those 35 available from Shell Chemical under the trademark KRATON which have a rubbery midblock such as butadiene or isoprene



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5 and polystyrene end blocks, and is especially useful because  
it is a self-adhesive material and can be applied to the  
layers of the garment without additional adhesive between  
the elastic means and the layers. The elastic means can be  
applied to the garment by any suitable means including  
adhesive bonding, heat sealing or sonic bonding, whichever  
10 is appropriate to the specific material selected for the  
elastic means.

Adhesion of the elastics 20 and 21 to the liner 16 and  
to the cover 17 is improved by addition of a dissimilar  
polymer to the liner/cover material. This is illustrated by  
15 addition of polypropylene to an ethylene methyl acrylate  
cover. It has been convenient to add the dissimilar polymer  
by addition of a yellow colorant Ampacet containing a yellow  
pigment and a polypropylene binder. This addition has been  
found particularly effective in EMA when a Fullastic self  
adhering elastic is used in the training pant.

20 Preferably, the front and back of the training pant are  
designated as such so as to permit the wearer to properly  
dress himself. This may be suitably accomplished by a label  
on the interior of the rear portion of the training pant.

25

#### Example

A disposable panty 10 as illustrated in Fig. 1 was  
constructed in a size suitable for use as a child's training  
panty with an elasticized waist opening as shown in Fig. 10,  
elasticized leg openings as shown in Fig. 11 and tearaway  
30 side seams. The material of the outer cover, or exterior  
panel, of the disposable underpant was a two-layer composite  
web having an outer layer of nonwoven polypropylene fibers  
and an inner layer of ethylene methyl acrylate extrusion  
coated onto the nonwoven fibrous outer layer. The panty had  
35 an interior panel comprising a bodyside liner of spun bonded

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5 polypropylene fibers. An absorbent batt of a composite of polypropylene microfibers and cellulosic fibers was sandwiched between the exterior panel and the interior panel.

10 The exterior seams were sealed ultrasonically with a series of 4 lines within a side seal of about 1/8". Testing of the panty established that it combined the features of liquid imperviousness due to the plastic inner layer of the outer cover and a clothlike appearance because of the fibrous outer layer of the outer cover. The sealing of the side seal seams was strong and complete and did not detract from the panty-like appearance of the garment. A useful disposable training pant was thereby provided that is expected to be well-received by parents and of a type that will aid and encourage children going through the toilet training stage.

20 There has thus been described a disposable underpant including an outer cover constructed of two layers of different materials wherein the inner layer is a plastic material capable of providing the desired degree of moisture imperviousness and the outer layer is a nonwoven fibrous material capable of presenting a clothlike or textile appearance and feel to the underpant. The garment further has an exterior side seal seam that is capable of holding the garment together without being obtrusive. It is believed that the new underpant herein described provides a construction that is an improvement over similar garments of the prior art and that it may therefore extend the use of disposable underpants, particularly as a training pant for a child who is ready to graduate from the diaper stage. The texture and feel, as well as the fit and absorbent capabilities, of the present underpant provide a disposable undergarment that can function to contain waste fluids and

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5 at the same time present a clothlike appearance which could  
encourage an infant to discontinue use of diapers. The  
foregoing disposable underpant can be more absorbent than a  
cloth training pant and does not require an additional  
protective rubber or plastic covering pant. Because the  
present garment has elasticized waist and leg openings, a  
10 young child of an appropriate age can readily raise and  
lower the underpant and thereby become accustomed to using  
the toilet without being dependent upon the aid of a parent.  
The neat tailored look of the present underpant should be of  
aid in promoting the use of the training pant in lieu of a  
15 diaper. Other important potential uses for the underpant  
herein described and claimed are an adult menstrual garment  
or an adult incontinence garment. The same factors come  
into play in these end uses, since a clothlike disposable  
underpant having an attractive tailored look is provided  
20 that should be particularly attractive for an adult.

The outside seal seam of the invention is particularly  
desirable when composite materials containing spunbonded  
material such as polypropylene or polyethylene are present.  
In the illustration set forth above the sealing system was  
25 satisfactory for sealing even when eight layers including  
adhesive layers were present. It is particularly desirable  
for a multi-layer sealing of thermoplastic materials. The  
seal of the invention is stronger than a single large seal  
and additionally the line structure does not detract  
30 extensively from the clothlike outer surface of the  
spunbonded surface on the garment illustrated.

While the invention has been specifically described  
with respect to training pants, other types of garments may  
also be formed by the sealing system of the invention  
35 utilizing an ultrasonically-sealed narrow seam having a  
plurality of lines of sealing. Other garments that the seal

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could be used for are training pants that have absorbent inserts rather than the disposable pants illustrated. Other garments to benefit by the side seam of the invention could be disposable bathing suits. The invention is also suitable for hospital garments such as gowns, as well as hospital underwear. Further, the invention could be utilized in formation of clothlike bags, and particularly is suitable for formation of clothlike disposable bags as it is easier to make them using the system of the invention as the garment or bag does not need to be turned inside out after formation.

The present invention has been described hereinabove by reference to several specific embodiments, but it is expected that those skilled in the art of manufacturing disposable garments will be able to devise modifications of the exemplary embodiments and it is intended that the appended claims encompass any such obvious modifications which are within the true spirit and scope of the present invention.

## WE CLAIM:

1. A disposable underpant of the type having a liquid-pervious inner bodyside liner<sup>(16)</sup> and a liquid-impervious outer cover<sup>(14)</sup> that define a front panel<sup>(11)</sup> and a rear panel<sup>(12)</sup>, and an absorbent batt<sup>(18)</sup> between the liner and the cover,

5 comprising, in combination:

(1) side seams<sup>(13)</sup> joining together part of marginal side portions of the front and rear panels<sup>(11,12)</sup> to define a three-dimensional underpant having a pair of leg openings<sup>(14)</sup> and a waist opening;<sup>(15)</sup>

10 (2) first elastic means<sup>(51)</sup> extending about one leg opening, second elastic means<sup>(52)</sup> extending about the other leg opening, and third elastic means<sup>(54)</sup> extending about the waist opening; and

15 (3) the outer cover<sup>(14)</sup> consisting of an inner layer<sup>(30)</sup> of liquid-impervious plastic material and an outer layer<sup>(31)</sup> of nonwoven fibrous material, wherein: the inner layer faces<sup>(30)</sup>, the absorbent batt<sup>(18)</sup> and the outer layer<sup>(31)</sup> is the exterior surface of the disposable underpant.

20 2. The undergarment of Claim 1, wherein the side seams<sup>(13)</sup> comprise at least one sealed exterior seam, at least one said seam being sealed with two narrow lines<sup>(80,84)</sup> and the total seam being less than about 3/16" side.

25 3. The underpant of Claim 1, wherein: the side seams<sup>(13)</sup> join together inturned contacting side edge portions of the front and rear panels arranged inside the underpant.

30 4. The underpant of Claim 3, wherein: the side seams<sup>(13)</sup> comprise a bond portion<sup>(25)</sup> in the range of 1/16" to 1/8" wide between the inturned side edge portions and a flap portion in the range of 1/8" to 3/8" wide between the bond portion<sup>(25)</sup> and the free ends<sup>(66)</sup> of the inturned side edge portions along which the inturned side edge portions are free of one another.

5. The underpant of Claim 1, wherein: the side seams<sup>(13)</sup> join together overlapped contacting side edge portions of the front and rear panels (44,42).
6. The underpant of Claim 1, 2, 3, 4 or 5, wherein: the side seams<sup>(13)</sup> include manually tearaway bonds between the front and rear panels.
7. The garment of Claim 1 wherein said seams<sup>(13)</sup> are sealed across the waist elastic (53).
8. The garment of Claim 1 wherein said sealing is ultrasonic.
9. The garment of Claim 1 wherein said seam<sup>(13)</sup> is about 1/8" wide and bonded on about 50% of said total seam area.
10. The garment of Claim 1 wherein said seam<sup>(13)</sup> is also at an elastic leg<sup>(52)</sup> and elastic waist (53).
11. The garment of Claim 1 wherein said at least one seam<sup>(13)</sup> comprises an ultrasonically-sealed seam at each side of said garment.
12. The method of Claim 1 wherein said seam comprises four narrow sealing lines (92,94, etc).
13. The method of Claim 1 wherein said sealing is by an ultrasonic anvil of 1/8" width applying about 400 to 600 psi pressure to said garment.
14. The method of Claim 13 wherein said anvil has a surface of 4 parallel lands<sup>(94)</sup> about 0.45 mm wide separated by valleys (92) about 0.35 mm wide.
15. The method of claim 1 wherein said seam<sup>(13)</sup> is about 1/8" wide and comprises four sealing lines (92,94, etc).
16. The method of Claim 1 wherein said lines are discontinuous.
17. The method of Claim 1 wherein said at least two lines comprise four lines.

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18. The underpant of Claim 1, 2, 3, 4 or 5, wherein: the inner layer<sup>(30)</sup> of the outer cover<sup>(47)</sup> is a layer of thermoplastic material extrusion coated into the outer layer of the outer cover.
- 5 19. The undergarment of Claim 18 wherein said absorbent batt<sup>(48)</sup> is formed having a front portion, a rear portion, and a crotch portion corresponding to said outside cover fabric.
20. The undergarment of Claim 18 wherein the traverse<sup>(42)</sup> measurement of the crotch portion of said absorbent batt<sup>(48)</sup> is less than about three inches.
- 10 21. The undergarment of Claim 18 wherein the traverse width of the absorbent material<sup>(48)</sup> in the crotch portion is 1/4 of the sum of the widest traverse measurements of the front and back portions.
- 15 22. An undergarment useful for toilet training children or incontinent children or adults comprising nonwoven fabric cover having: a) a front portion<sup>(41)</sup>, a rear portion<sup>(42)</sup> and a crotch portion connecting said front and rear portions, both side margins of said front portion being joined to
- 20 respective side margins of said rear portion so as to define a three-dimensional undergarment having a pair of leg openings<sup>(14)</sup> and a waist opening<sup>(15)</sup>; b) a liquid pervious inner liner<sup>(16)</sup>; and c) an absorbent batt<sup>(18)</sup> between said liner and said fabric cover, a first elastic means<sup>(52)</sup> extending about one leg
- 25 opening, a second elastic means<sup>(52)</sup> extending about the other leg opening, and a third elastic means<sup>(53)</sup> extending about the waist opening.
23. The undergarment of Claim 22 wherein the thickness of the absorbent batt<sup>(48)</sup> in the crotch portion is from about 1.5
- 30 to about 5 times the thickness of the absorbent batt in said front and rear portions.
24. The undergarment of Claim 22 wherein the thickness of the batt in the crotch portion<sup>(48)</sup> is about twice the thickness of the batt in said front and rear portions.

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25. The undergarment of Claim 22 wherein the absorbent batt (18) is outwardly bulging in said crotch portion.
26. The undergarment of Claim 18 wherein said absorbent batt<sup>(18)</sup> is attached to said fabric cover.
- 5 27. The undergarment of Claim 22 wherein said absorbent batt<sup>(18)</sup> comprises a superabsorbent.
28. The undergarment of Claim 25 wherein said superabsorbent is confined to a pre-determined region with said absorbent batt (18).
- 10 29. The undergarment of Claim 26 wherein said superabsorbent is disposed in the layer region of said batt (18) immediately adjacent to said fabric cover.
30. The disposable undergarment of Claim 18 wherein said first and second elastic means<sup>(52)</sup> comprises at least two elastic members<sup>(46,47)</sup> wherein the tension on the member closest to
- 15 said absorbent batt is greater than the tension on the member furthest from said absorbent batt.
31. The undergarment of Claim 30 wherein the ratio of the tension on said closest member<sup>(44)</sup> to said furthest member<sup>(46)</sup> is
- 20 from about 4:3 to about 3:2.
32. The undergarment of Claim 18 wherein the tension on said first and second elastic means<sup>(52)</sup> ranges from about 165 to about 220 grams.
33. The undergarment of Claim 32 wherein the tension on said first and second elastic means<sup>(52)</sup> ranges from about 180 to about 200 grams.
- 25 34. The undergarment of Claim 18 wherein the tension on the third elastic means ranges<sup>(53)</sup> from about 330 to about 450 grams.
- 30 35. The undergarment of Claim 34 wherein the tension on said third elastic means<sup>(53)</sup> ranges from about 360 to about 380 grams.
36. The undergarment of Claim 18 wherein said fabric cover (14) comprises a non-stretchable material.



37. The undergarment of Claim 18 wherein said absorbent batt<sup>(18)</sup> is substantially absent from the front and rear panels<sup>(25, 26)</sup> transversely extending beyond a longitudinal line/ extending from outside traverse edges of said crotch portion.

5 38. The undergarment of Claim 18 wherein said fabric cover (14) comprises stretchable material.

39. The undergarment of Claim 18 wherein said absorbent (18) batt comprises a material having a dry tensile strength ranging from about 250 ergs/cm<sup>2</sup> to about 550 ergs/cm<sup>2</sup>.

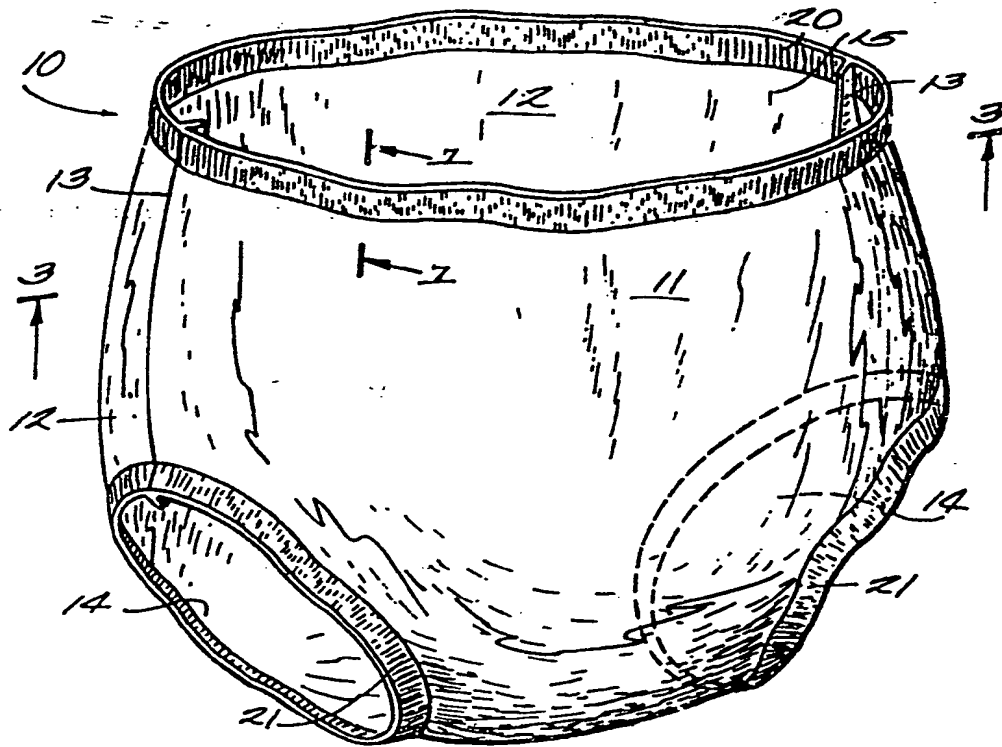


FIG. 1

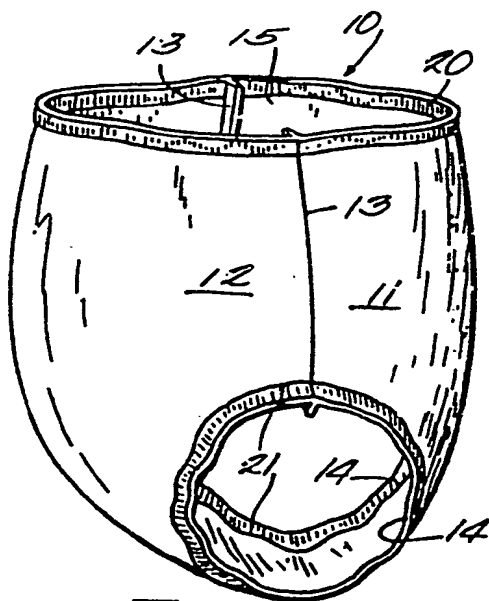
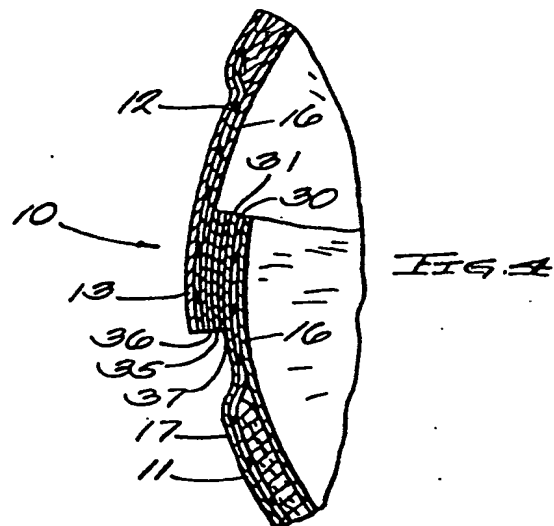
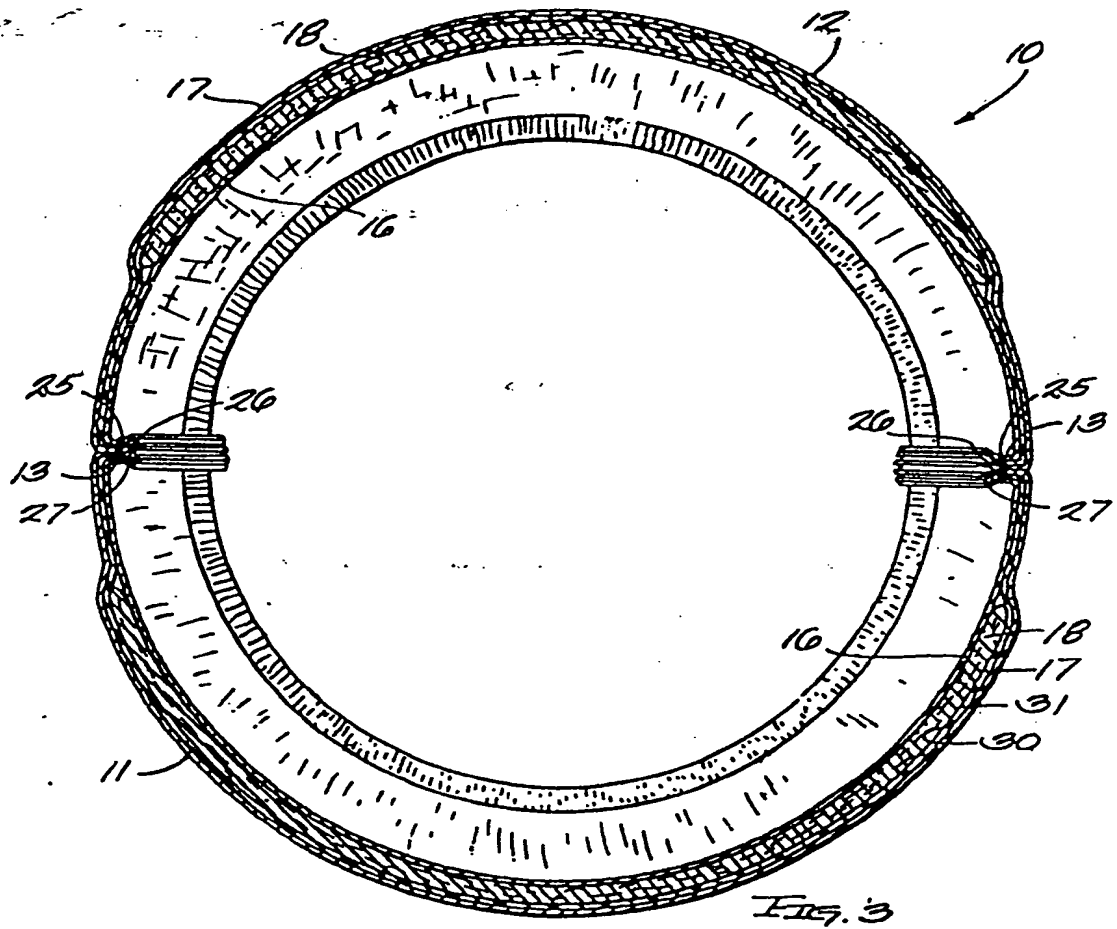
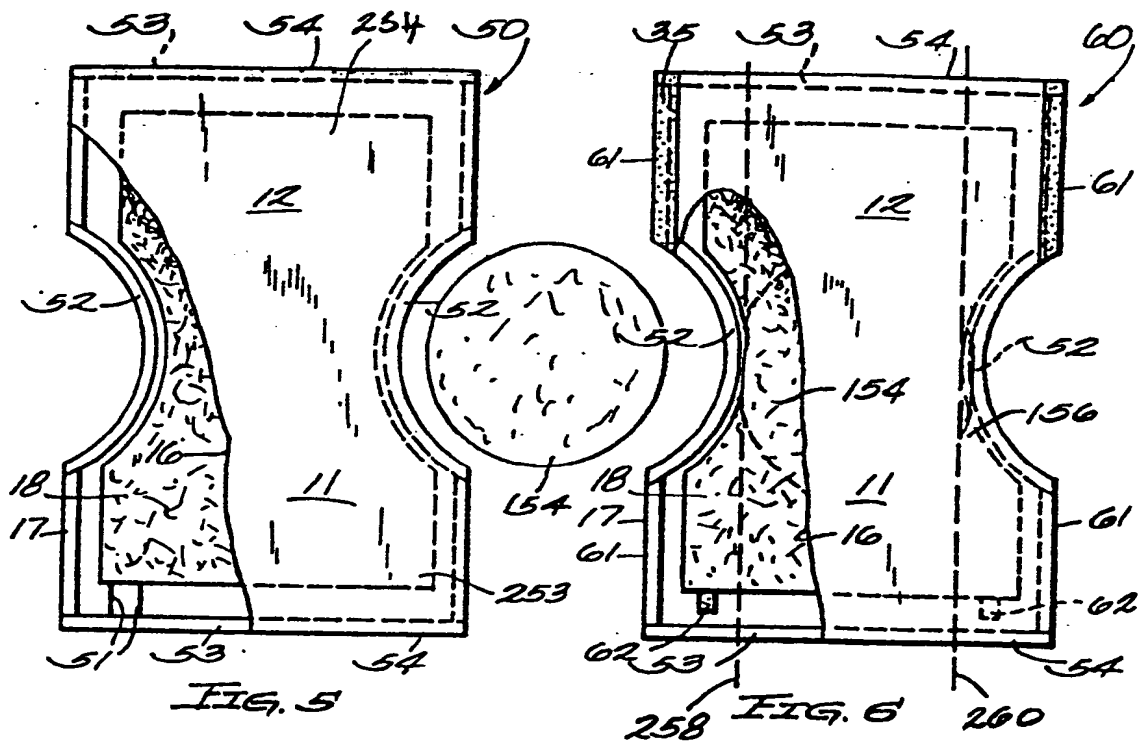


FIG. 2





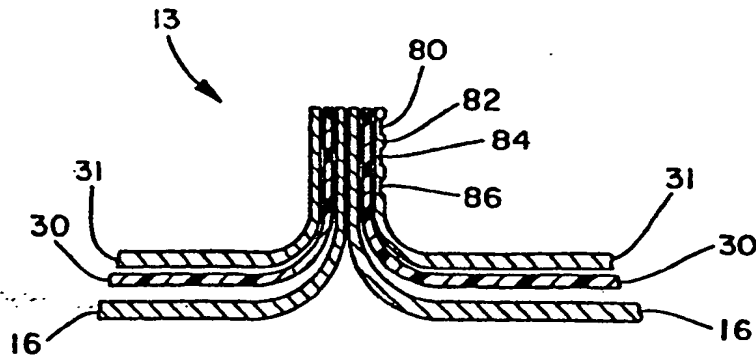


FIG. 7

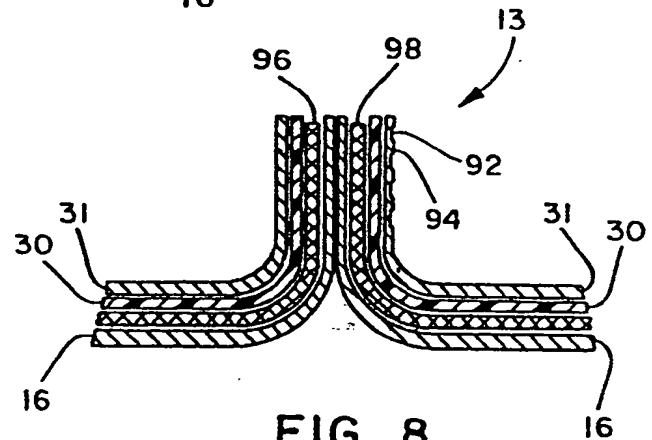


FIG. 8

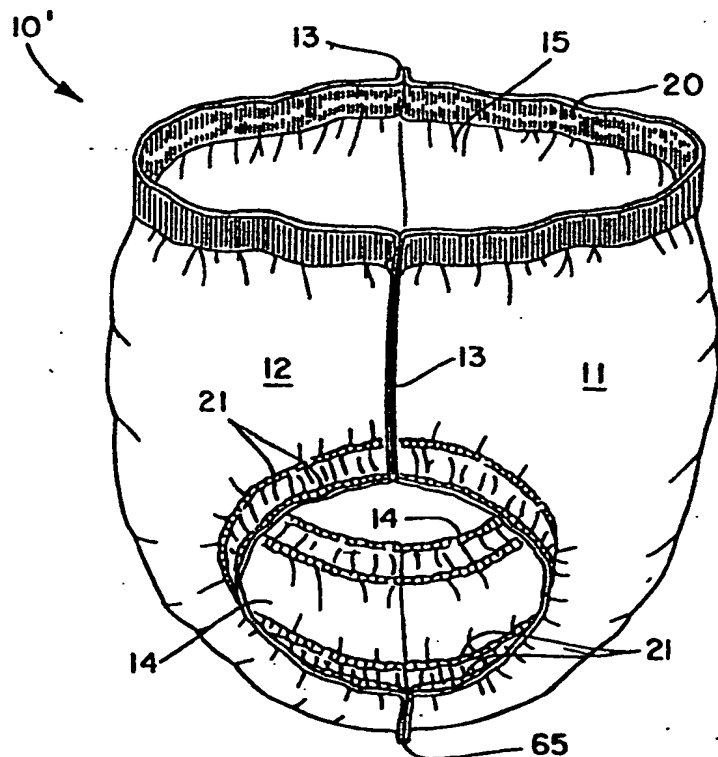


FIG. 9

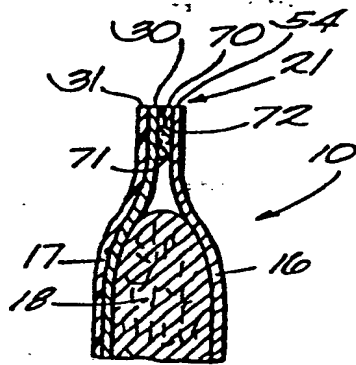


FIG. 10

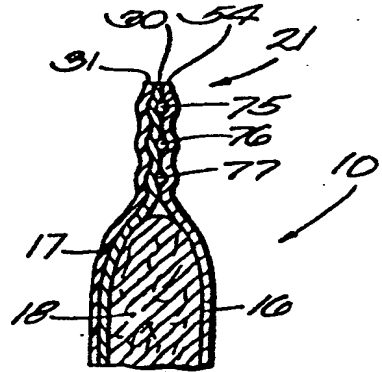


FIG. 11

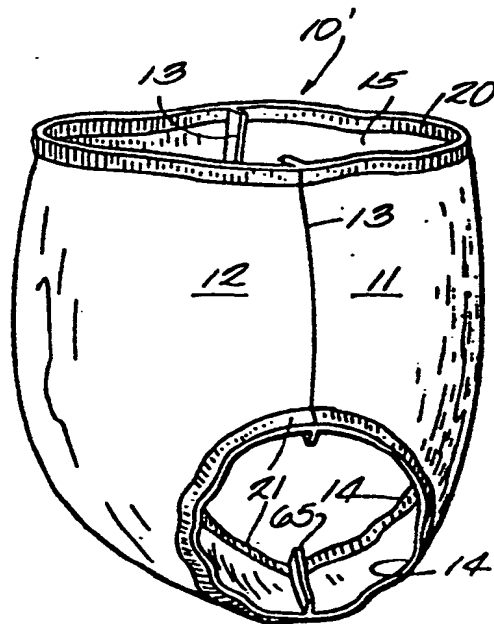


FIG. 12

(19)



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(71) Applicant: **KIMBERLY-CLARK CORPORATION**  
401 North Lake Street  
Neenah Wisconsin 54956(US)

(72) Inventor: Heran, William M.  
108 Limekiln Drive  
Neenah Wisconsin(US)

(72) Inventor: Fleischer, Glen R.  
533 Kessler Drive  
Neenah Wisconsin(US)

(72) Inventor: Damico, Joyce Ann  
1219 Green Acres Lane  
Neenah Wisconsin(US)

(72) Inventor: Van Gompel, Paul Theodore  
route 2, Box 227  
Hortonville Wisconsin(US)

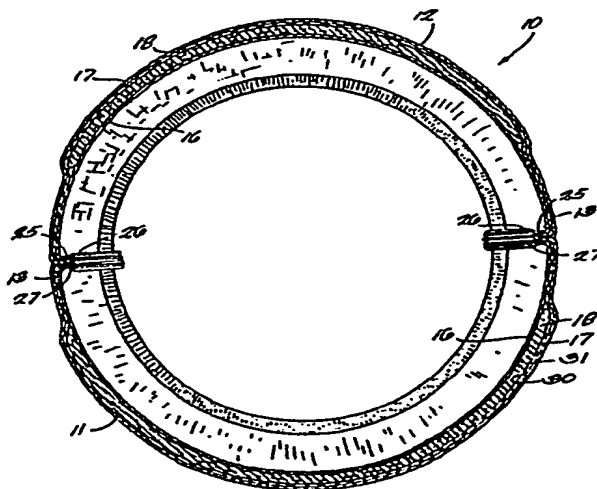
(72) Inventor: Van Deurzen, John Irvin  
224 Fredrick Street  
Menasha Wisconsin(US)

(72) Inventor: Strohteen, David Thomas  
106 Cherry Court  
Appleton Wisconsin(US)

(74) Representative: Sauvage, Renée  
Cabinet Sauvage 100 bis, avenue de Saint-Mandé  
F-75012 Paris(FR)

(54) Disposable underpants, such as child's training pants and the like.

(57) A disposable underpant comprising a front panel (11) and rear panel (12) joined together along side seams (13) to provide a three-dimensional garment having a pair of elasticized leg openings and an elasticized waist opening, and including a bodyside liner (16), outer cover (17) and absorbent batt (18) therebetween, in which the outer cover (17) has an inner layer (30) of plastic material and an outer layer (31) of nonwoven fibrous material.



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European Patent  
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# EUROPEAN SEARCH REPORT

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Application number

EP 86 40 0040

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-4 205 679 (V.L. REPKE et al.) * Abstract; figures 1-22 *	22	A 41 B 13/02
A	---	1,2,5,7,8	
A	US-A-3 424 162 (I. PARRAVICINI) * Figures 3,6 *	3	
A	---		
A	FR-A-2 229 383 (SCOTT PAPER CO.) * Figures 6-10,13-16 *	23-25	
A	---		
A	FR-A-2 124 196 (T. DENIS) * Figure *	23-25	
A	---		
A	US-A-4 333 463 (D.C. HOLTMAN) * Figure 2 *	27-29	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07-07-1987	Examiner GARNIER F.M.A.C.
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